Three Bays & Centerville River

Technologies and Approaches
What is the stakeholder process?
208 Planning Process

Public Meetings
- Goals, Work Plan & Roles
- Affordability, Financing

Watershed Working Groups
- Baseline Conditions
- Technology Options Review
- Watershed Scenarios

July  August  September  October  December
Goal of the First Meeting:

To review and develop shared understanding of the characteristics of these watersheds, the work done to date, existing data and information available, and how to apply all of this to planning for water quality improvements for these watersheds moving forward.
Progress since last meeting

- Meeting materials
Progress since last meeting

- Meeting materials
- GIS data layers
Progress since last meeting

- Meeting materials
- GIS data layers
- Chronologies
Baseline Conditions

11 Working Group Meetings: Sept 18-27

Technology Options Review

11 Working Group Meetings: Oct 21-Nov 5

208 Planning Process
208 Planning Process

Baseline Conditions
11 Working Group Meetings: Sept 18-27

Technology Options Review
11 Working Group Meetings: Oct 21-Nov 5

Watershed Scenarios
11 Working Group Meetings: Dec 2-11
Wrap up of Cape2O: ur in charge!

Summary of planning process to date

Outline of second 6 months of the 208 planning process
Goal of Today’s Meeting:

To develop a shared understanding of the potential technologies and approaches identified to date, and the benefits and limitations of each; to explore the environmental, economic, and community impacts of a range of categories of solutions; and to identify priorities and considerations for applying technologies and approaches to remediate water quality impairments in your watershed.
Technologies and Approaches for Improving Water Quality
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- The Fact Sheets present various information on the technologies being considered.
- Additional information is contained on the Technology Matrix including the following:
  - Site Requirements
  - Construction, Project and Operation and Maintenance Costs
  - Reference Information
  - Regulatory Comments
- Input from the Stakeholders is requested regarding a technology’s Public Acceptance
Technologies and Approaches for Improving Water Quality

- Comprehensive analysis of nutrient control technologies and approaches.
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- Certain technologies or approaches will be effective at preventing nutrients from entering the water body. Others will be effective at reducing or remediating nutrients that are already in the groundwater or water body.
- Regulatory programs can address nutrient controls for both existing development and future development.
Waterless Urinal

IBC container (220 gallons)

40” x 40” x 48”

Source: Earle Barnhart, The Green Center Inc. and Horsley-Witten Group Inc.
bathroom is odor-free
air is continuously drawn
down the toilet and is
exhausted out a roof vent

Source: Earle Barnhart, The Green Center Inc.
Precedent: 12th Ave. Stormwater Project, Portland, OR

Source: City of Portland
Rain Gardens
<table>
<thead>
<tr>
<th>Site Scale</th>
<th>Neighborhood</th>
<th>Watershed</th>
<th>Cape-Wide</th>
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<td>Compact Development</td>
<td>Remediation of Existing Development</td>
<td>Fertilizer Management</td>
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<td>Cluster &amp; Satellite Treatment Systems</td>
<td>TDR</td>
<td>Stormwater BMPs</td>
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<td>Standard Title 5 Systems</td>
<td>Conventional Treatment</td>
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<td>IA</td>
<td>I/A Title 5 Systems</td>
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<td>I/A Enhanced Systems</td>
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<td>Wastewater Collection Systems</td>
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<td>Toilets: Urine Diverting</td>
<td>Effluent Disposal Systems</td>
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<td>Toilets: Composting</td>
<td>Constructed Wetlands: Surface Flow</td>
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<td>Toilets: Packaging</td>
<td>Constructed Wetlands: Subsurface Flow</td>
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<td>Stormwater: Bioretention / Soil Media Filters</td>
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<td>Stormwater: Wetlands</td>
<td>Phytoirrigation</td>
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<td>Shellfish and Salt Marsh Habitat Restoration</td>
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<td>Surface Water Remediation Wetlands</td>
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</table>
Scale: NEIGHBORHOOD
Target: WASTEWATER

Cluster & Satellite Treatment Systems
Precedent: Living Machine - South Burlington, VT + Photobioreactors - Falmouth, MA
Source: Todd Ecological and Tom Cambureri
Precedent: Missouri
Source: AECOM

Stormwater Wetlands
Solutions: Watershed

Site Scale
- Compact Development
- Standard Title 5 Systems
- I/A Title 5 Systems
- I/A Enhanced Systems
- Toilets: Urine Diverting
- Toilets: Composting
- Toilets: Packaging
- Stormwater: Bioretention / Soil Media Filters
- Stormwater: Wetlands

Neighborhood
- Cluster & Satellite Treatment Systems
- STEP/STEG Collection
- Constructed Wetlands: Surface Flow
- Constructed Wetlands: Subsurface Flow
- Stormwater: Wetlands

Watershed
- Remediation of Existing Development
- Conventional Treatment
- Advanced Treatment
- Effluent Disposal: Out of Watershed/Ocean Outfall
- Phytoirrigation
- Eco-Machines & Living Machines
- Phytobuffers
- Permeable Reactive Barrier

Cape-Wide
- Transfer of Development Rights
- Stormwater BMPs
- Fertilizer Management
- Shellfish and Salt Marsh Habitat Restoration
- Aquaculture/Shellfish Farming
- Inlet / Culvert Widening
- Pond and Estuary Dredging
- Surface Water Remediation Wetlands
Precedent: Koh Phi Phi Treatment Wetland, Thailand

Source: Hans Brix
Precedent: Woodburn OR, Wastewater Treatment Facility
Source: CH2M Hill
Precedent: Woodburn OR, Wastewater Treatment Facility

Source: CH2M HILL
Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Phytobuffers
Precedent: Phytobuffer - Kavce, WY
Source: Sand Creek Consultants
Precedent:
Pine Hills
Plymouth, MA
Precedent:
Pine Hills
Plymouth, MA
Precedent:
Pine Hills
Plymouth, MA
Interceptor/Irrigation Wells
WWTP
Zone II

Precedent:
Pine Hills
Plymouth, MA
**Measuring Oysters' Improvements on Water Quality**

- already 2-3 million additional oysters
- gain 3,000 pounds of nitrogen removed per year
- 100 percent increase in commercial shellfish values of $1 million/year
- increased water filtration approximately $80 million/y
- ammonia control
- cadmium reduction
- increased turtle, eel, juvenile fish habitat

**Overall project areas with new oysters**

**New oyster on resting oyster**

**Source:** Anamarija Francik

**Precedent:** Wellfleet Oyster Restoration Project

**Shellfish Habitat Restoration**
Precedent: Wellfleet Oyster Restoration Project

Source: Anamarija Francik

Shellfish Habitat Restoration
Precedent: Shanghai Houton Park
Source: Turenscape
Transfer of Developments Rights
The Concept

Owner of “sending” parcel sells development rights in exchange for permanent conservation easement.

Owner of “receiving” parcel buys development rights to build at densities higher than allowed under base zoning.

Source: Massachusetts Smart Growth Toolkit
## Town Consideration of Alternative Technologies & Approaches

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<th>Location</th>
<th>Description</th>
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<td>Wellfleet</td>
<td>Coastal habitat restoration &amp; aquaculture</td>
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<td>Mashpee</td>
<td>Aquaculture &amp; Expanding Existing Systems</td>
</tr>
<tr>
<td>Brewster</td>
<td>PRB &amp; Bioswales</td>
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<tr>
<td>Orleans</td>
<td>Fertilizer Control By-Law</td>
</tr>
<tr>
<td>Harwich &amp; Chatham</td>
<td>Muddy Creek &amp; Cold Brook Natural Attenuation</td>
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</table>
| Falmouth | Aquaculture  
Inlet Widening  
Eco-Toilet Demonstration Project  
PRBs  
Stormwater Management (Little Pond Watershed)  
Fertilizer Control By-Law  
Subsurface Nitrogen Removal Septic Systems |
Problem Solving Approach

Targets/Reduction Goals

Present Load: $X$ kg/day
Target: $Y$ kg/day
Reduction Required: $N$ kg/day

Other Wastewater Management Needs
A. Title 5 Problem Areas
B. Pond Recharge Areas
C. Growth Management

Low Barrier to Implementation
A. Fertilizer Management
B. Stormwater Mitigation

Watershed/Embayment Options
A. Permeable Reactive Barriers
B. Inlet/Culvert Openings
C. Constructed Wetlands
D. Aquaculture

Alternative On-Site Options
A. Eco-toilets (UD & Compost)
B. I/A Technologies
C. Enhanced I/A Technologies
D. Shared Systems

Priority Collection/High-Density Areas
A. Greater Than 1 Dwelling Unit/acre
B. Village Centers
C. Economic Centers
D. Growth Incentive Zones

Supplemental Sewering
Nitrogen Load

Existing Controllable Load

Portion of Septic Load

Portion of Septic Load

Required Reduction

Required Reduction

Fert. & Storm.

Target Load

Target Load
**Targets/Reduction Goals**

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**Supplemental Sewering**
Triple Bottom Line

Impacts of Technologies and Approaches

Environmental

Economic

Social
Technology Selection: Process and Principles

- 100% septic removal subwatershed
- Scale: On-Site vs. Collection System vs. Natural System
- Nutrient intervention and time of travel
- Permitting Status
- Land use and Impacts of Growth
Preparing for Meeting 3 and Beyond

- Review tools and alternatives analysis approach

- Evaluating scenarios for meeting water quality goals

- Attend the November 13th meeting:
  6:00
  Cape Cod Museum of Art
  Dennis, MA